

REMARKS

This application has been reviewed in light of the Office action dated October 16, 1998. Claims 1-11 are pending in the application. Claims 1 and 8 have been amended. No new matter has been added. The examiner's reconsideration of the rejection in view of the amendments and the following remarks is respectfully requested. The FIGS. 1, 2, 3A, 3B, 6 and 8 have been corrected in accordance with the Examiner's suggestions. The specification has been amended to correct typographical errors.

By the Office Action, the Examiner objects to the specification based on the use of "vertical surfaces" on page 2 line 2. The Applicants' believe that the use of vertical surfaces is correct as diffusion regions may run adjacent to said vertical surfaces.

By the office action, claim 1 stands rejected under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicant regards as his invention.

Applicants respectfully submit that claim 1 has been amended in a manner believed to overcome this rejection.

By the office action, claims 8 and 11 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Kurita (Japanese Patent No. 1-282836, herein after Kurita). The Examiner stated that Kurita includes the claimed trench isolation structure in FIG. 2h of Kurita.

Kurita is directed to a semiconductor structure which prevents generation of crystal defects and improves the yield of an integrated circuit by oxidizing the side walls of a U trench 16. To this end, Kurita attempts to line sidewalls of the U trench with silicon dioxide 22 (see PURPOSE of Kurita). The silicon dioxide lining on the walls assists in preventing the crystal defects to which the invention is directed. Kurita forms the nitride layer 19 to assist in the formation of the silicon dioxide structure 22 so that the silicon dioxide material lines the walls of

the trench. As shown in FIG. 2h of Kurita, U trench 16 is blocked off by silicon oxide layer, and does not completely fill the trench. Nitride layers 13 and 19 are used " as protective masks to shape a[n] silicon oxide film 22, and the upper section in the U trench 16 is blocked" as described in the CONSTITUTION section lines 10-11 of Kurita. Therefore, Kurita does not appear to disclose or suggest a nitride liner being completely filled with a dielectric material which also completely fills the trench. Kurita describes the nitride layer 19 as a structure used to assist in the formation of the silicon dioxide structure 22 so that the silicon dioxide material lines the walls of the trench.

The Applicants' claimed invention includes, *inter alia*, an oxide fill disposed above a nitride liner, such that said oxide fill extends above and below an uppermost surface of said nitride liner substantially to a top surface of said substrate and completely filling below the uppermost surface, respectively. Kurita does not disclose or suggest completely filling below the uppermost surface to form a trench isolation structure. Instead, Kurita only describes lining walls of the U trench with an oxide material and not completely filling the trench. Therefore, Kurita does not disclose or suggest the Applicant's claimed invention. Claim 8 has been amended to clarify the invention.

The afore-mentioned fundamental differences between Kurita and the presently claimed invention provide sufficient basis to reverse this rejection. Kurita does not disclose or suggest an oxide fill disposed above a nitride liner, such that said oxide fill extends above and below an uppermost surface of said nitride liner substantially to a top surface of said substrate and completely filling below the uppermost surface, respectively. Accordingly, withdrawal of the rejection of claim 8 is respectfully requested for at least the reasons stated. Independent claim 8 is believed allowable. The dependent claims 11 is also believed allowable for at least the reasons stated and based on its dependency on a claim believed to be allowable.

By the office action, claims 1-7, 9 and 10 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kurita.

As described above, Kurita is directed to preventing crystal defects in a substrate by lining walls of a trench with silicon oxide. Nitride layers (antioxidizing films) 13 and 19 are used to effect the lining of the walls with silicon dioxide layer 22. Kurita does not appear to suggest a transistor nor does Kurita appear to suggest providing a nitride liner below a transistor channel depth. Further, the nitride layer of Kurita being formed at 1000 nm depth is not motivated by the presence of a channel depth of an adjacent transistor. Kurita does not suggest the nitride liner being completely filled by a dielectric material. Instead, Kurita shows only a method of lining trench walls with silicon dioxide by employing antioxidantizing films 13 and 19. The antioxidantizing films being such that a silicon dioxide layer 22 lines the walls of the trench. The depth of nitride layer in Kurita is a function of the depth of which crystal defects are to be prevented and not related in any way or dependent upon the depth of a transistor channel.

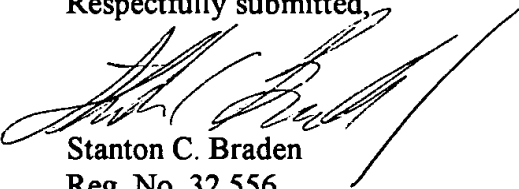
The Applicants' claimed invention includes, *inter alia*, a nitride liner recessed within said trench and the nitride liner forming a partially enclosed volume, said partially enclosed volume being completely filled with a dielectric material which also completely fills the trench, such that an uppermost surface of said nitride liner is disposed below a transistor channel depth of a transistor disposed in a well beside said shallow trench isolation structure. Kurita does not suggest a nitride liner being completely filled with a dielectric material which also completely fills the trench. Kurita does not disclose or suggest a nitride liner which is disposed below a transistor channel depth to relieve hot carrier effects.

No motivation exists to apply the teachings of Kurita, namely, lining trench walls with silicon dioxide to prevent crystal defects to the present invention which relates to hot carrier effects related to transistors. The afore-mentioned fundamental differences between Kurita and

the presently claimed invention provide sufficient basis to reverse this rejection. Kurita does not teach or suggest a nitride liner recessed within said trench and the nitride liner forming a partially enclosed volume, said partially enclosed volume being completely filled with a dielectric material which also completely fills the trench, such that an uppermost surface of said nitride liner is disposed below a transistor channel depth of a transistor disposed in a well beside said shallow trench isolation structure. Claim 1 has been amended to clarify the invention and is believed allowable for at least the reasons stated. Claims 2-7, 9 and 10 are believed allowable for at least the reasons stated and due to their dependency on claims believed to be allowable.

In view of the foregoing amendments and remarks, it is respectfully submitted that all the claims now pending in the application are in condition for allowance. Early and favorable reconsideration of the case is respectfully requested.

Respectfully submitted,



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FIG. 1
(Prior Art)

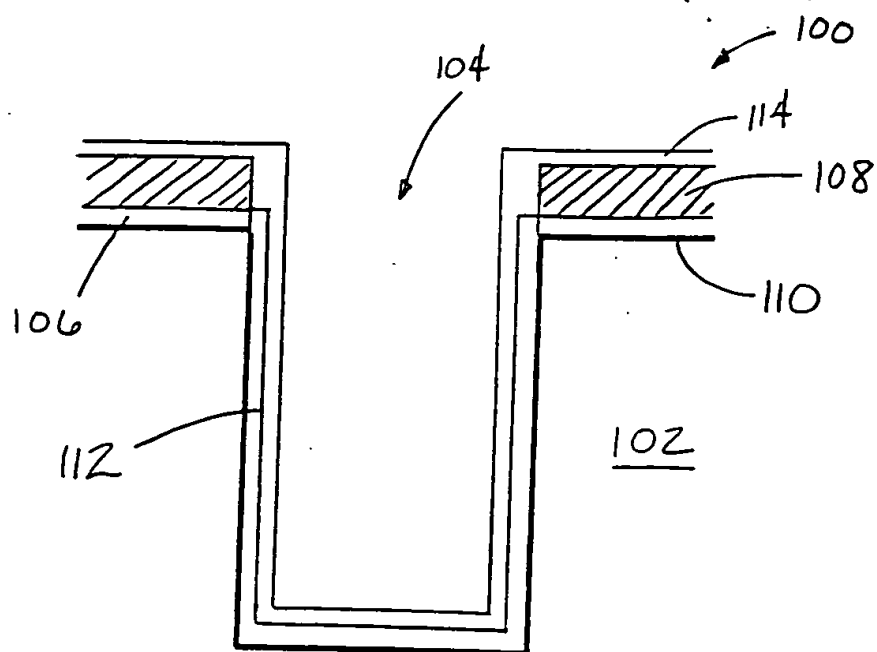


FIG. 2
(Prior Art)

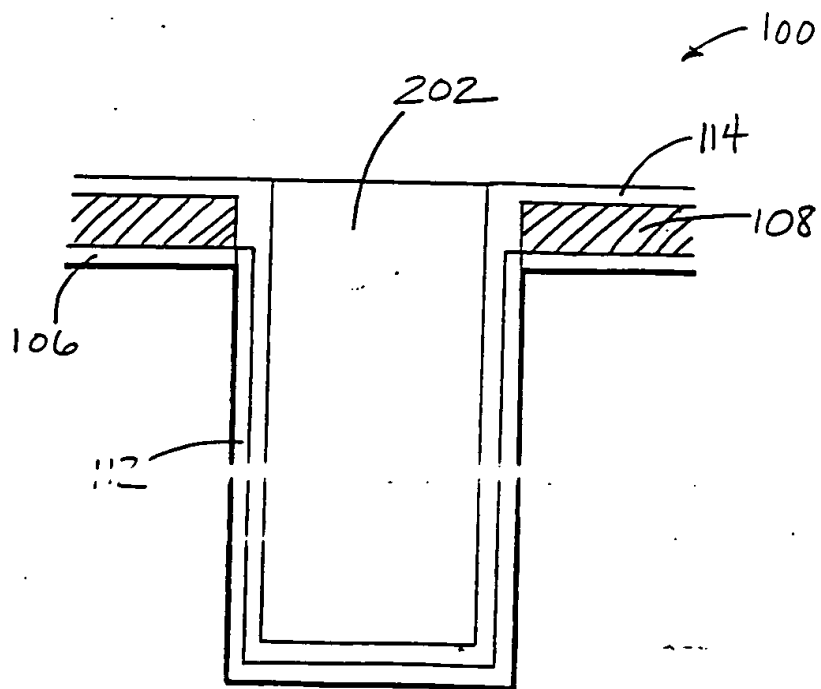


FIG. 3A
(Prior Art)

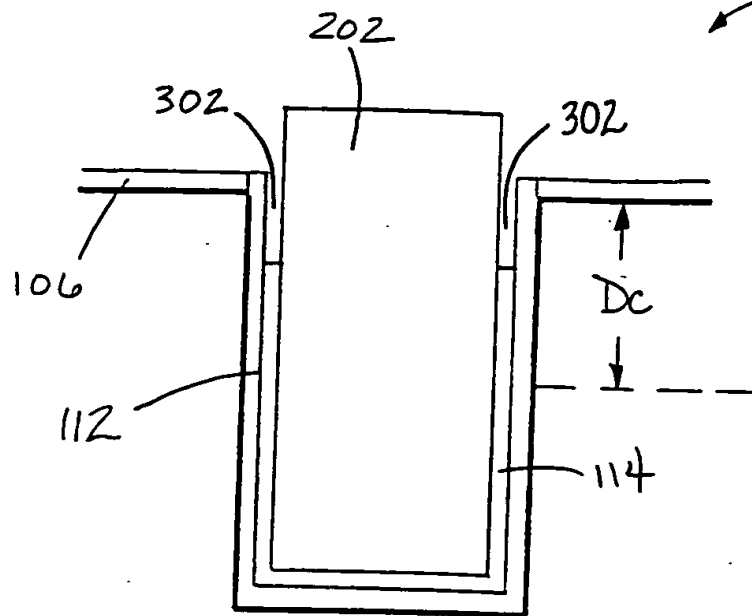


FIG. 3B
(Prior Art)

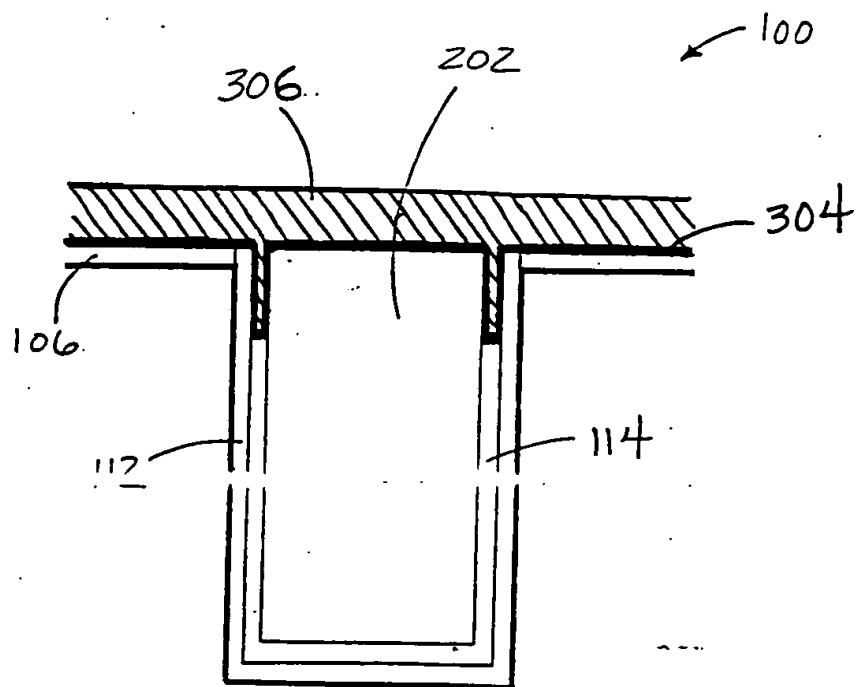


FIG. 6

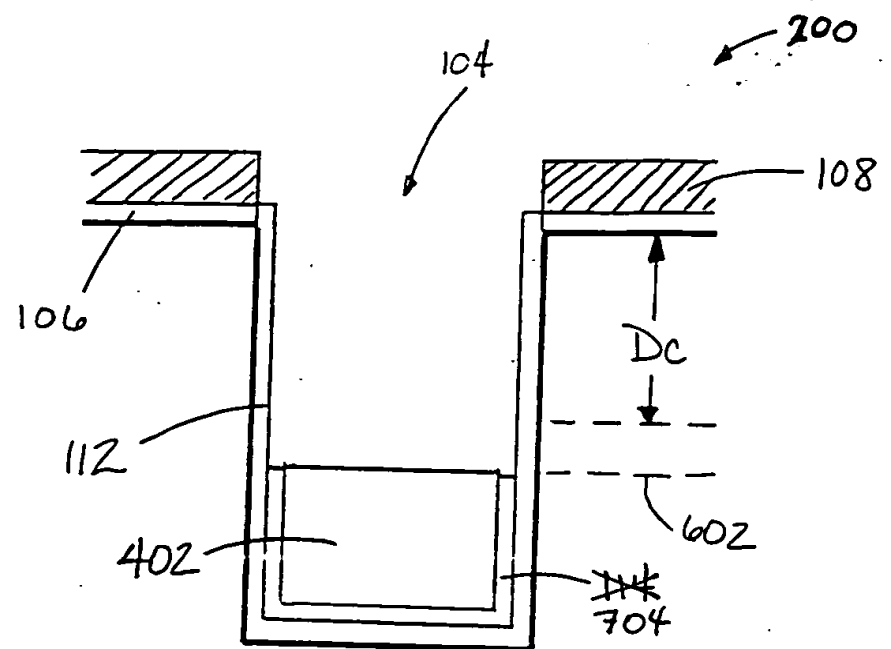


FIG. 7

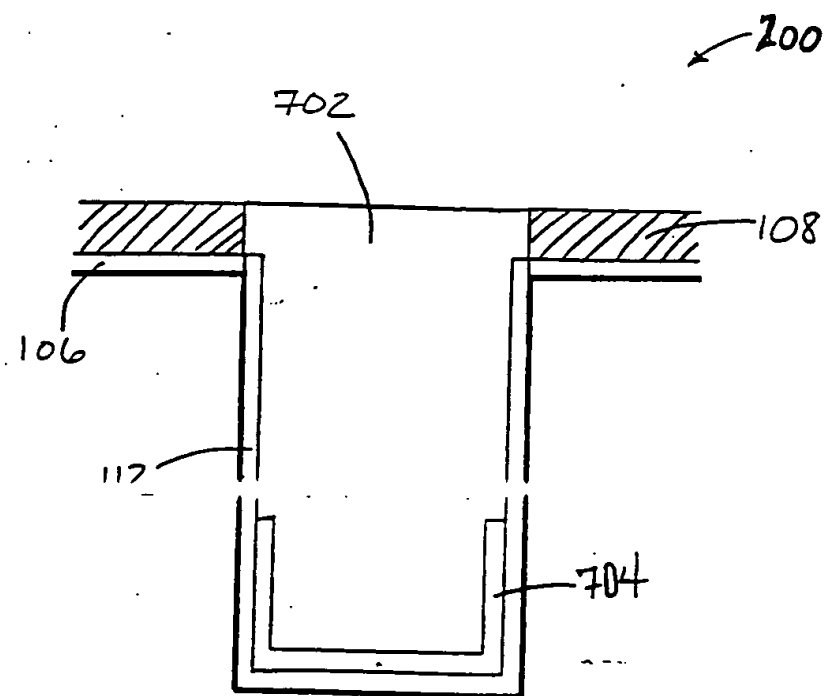


FIG. 8

